Honors Biology Bellringer:

What is the biological definition of **active transport**?

the movement of chemical substances, usually across the cell membrane, against a concentration gradient; requires cells to use energy

Standard: SB1. Students will analyze the relationship between structure and function in living cells.

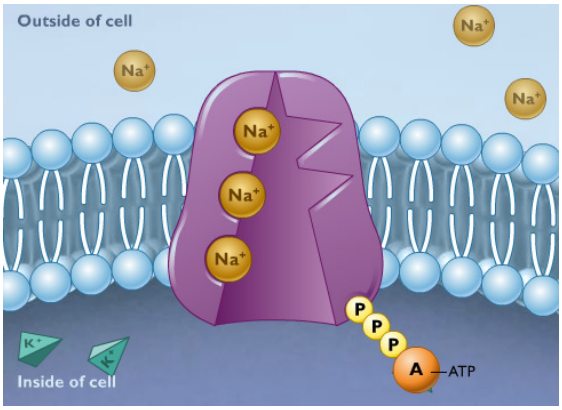
Element: a. Explain the role of cell organelles for prokaryotic and eukaryotic cells, including the cell membrane, in maintaining homeostasis and cell reproduction.

EQ: How do cells use energy to transport materials across the cell membrane?

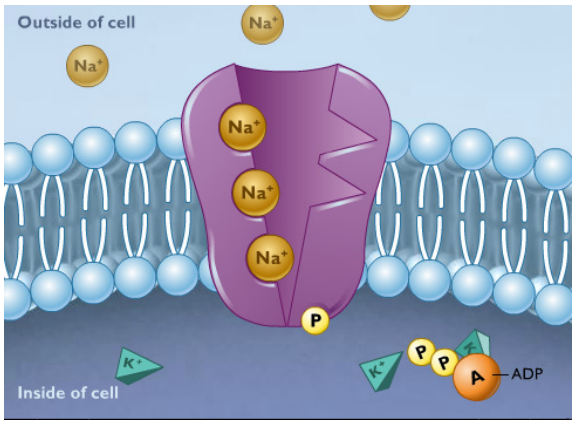
I) Active transport using transport proteins
   1) ATP molecules are used to transport materials across a membrane through a protein.
   2) Example: Sodium-Potassium Pump

http://highered.mcgraw-hill.com/sites/0072495855/student_view0/chapter2/animation__how_the_sodium_potassium_pump_works.html

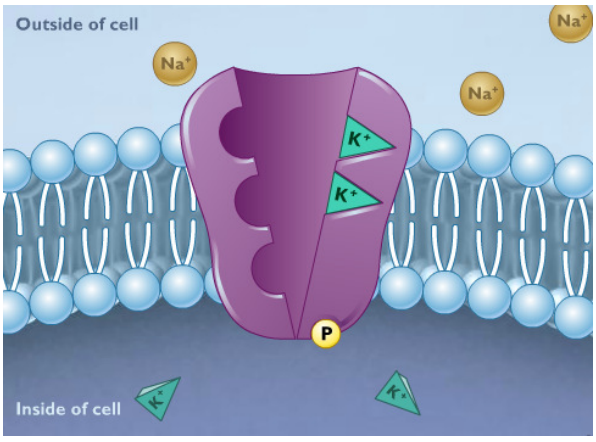
1) The transport protein is originally open to the cytoplasm of the cell. In this shape, it strongly attracts sodium ions (Na^+). Three sodium ions bond to the inside of the protein.



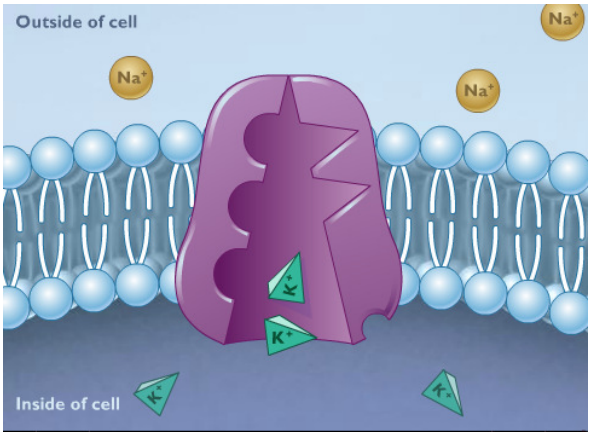
2) With the help of a molecule of ATP, the protein (with sodium ions attached) opens to the outside of the cell. In this shape, the protein loses its attraction to the sodium ions and they are released.



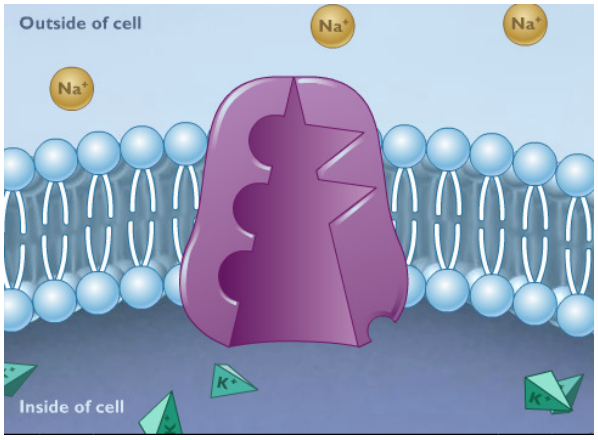
3) At this point, the shape of the protein strongly attracts potassium ions (K^+).



4) The attachment of potassium ions causes the protein to change back to its original shape, releasing the K^+ into the cytoplasm.



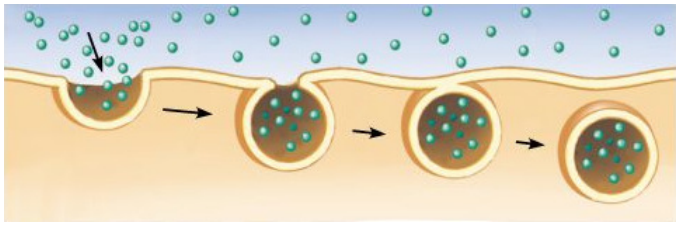
5) Both Na^+ and K^+ are being moved ***against*** their concentration gradients.



II) Active transport using vesicles

A) Endocytosis

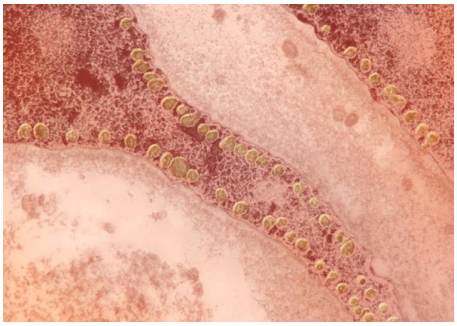
1) Endocytosis is the transport of particles into the cell through the use of a vesicle.



a) Pinocytosis: "cell drinking"

(1) Occurs when a membrane vesicle forms around the liquid outside a cell

(2) Example: in the human intestine, cells absorb fat droplets by pinocytosis

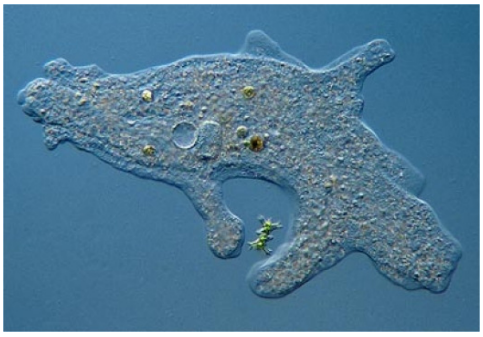


b) Phagocytosis: "cell eating"

(1) Occurs when a cell extends its cytoplasm (called a **pseudopod**) to surround a particle, engulf it, and bring it into the cell

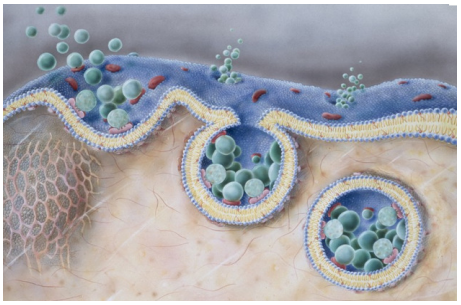
(2) Lysosomes digest the particle using enzymes

(3) Example: an amoeba "eating" a food particle

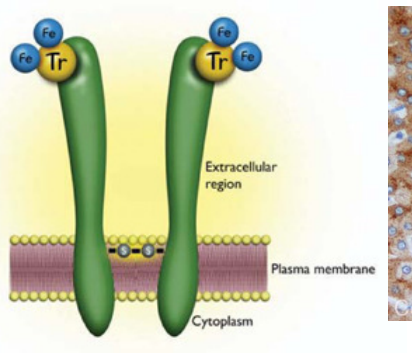


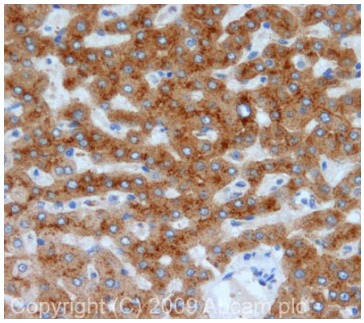
c) Receptor-mediated Endocytosis

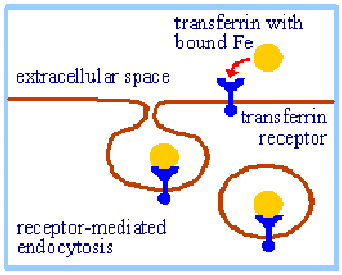
(1) The cell membrane contains pits or indentations that are concentrated in receptor proteins specific to certain particles. When the receptor proteins bind to these particles, the membrane pinches off and forms into a vesicle inside the cell.

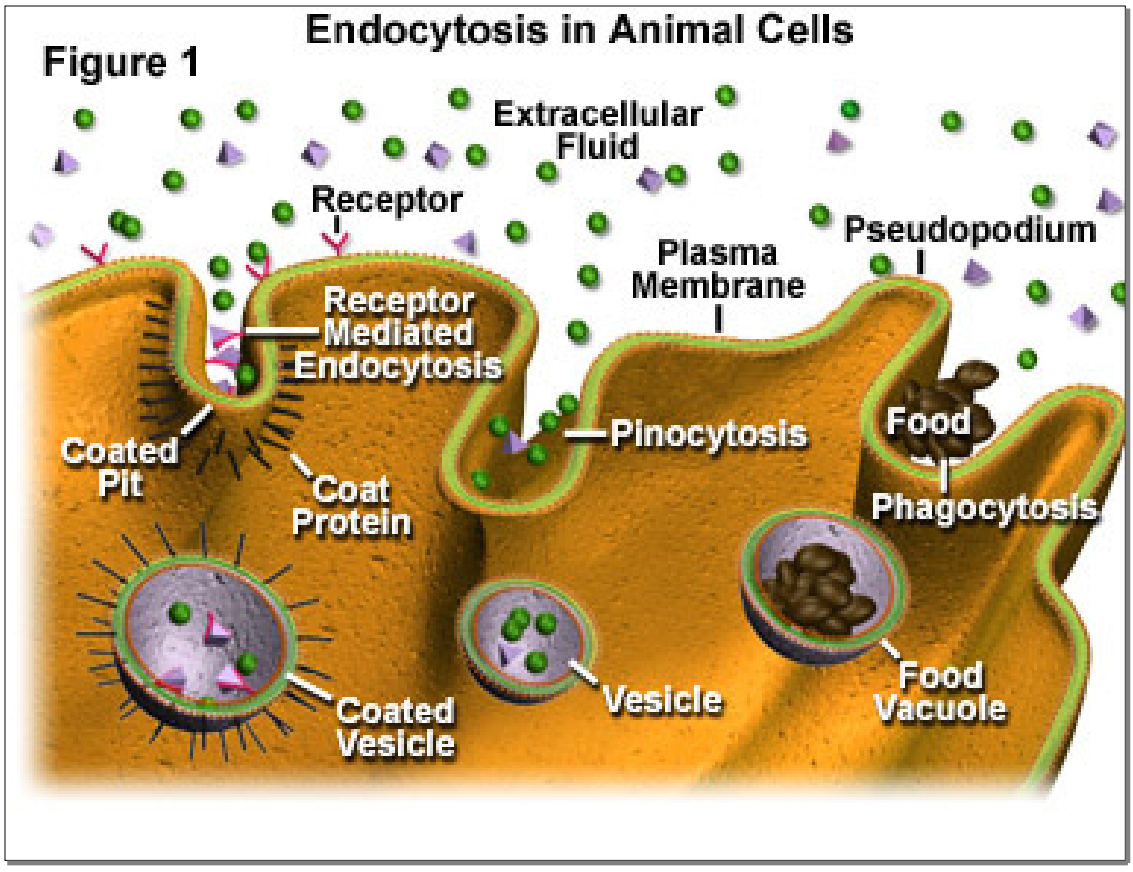


(2) Example: In your blood, iron is carried by proteins called **transferrin**. The cell membrane has receptor proteins that recognize transferrin. This allows a cell to take in iron without absorbing many other molecules that aren't needed.









b) Exocytosis

(1) Exocytosis is the transport of particles out of the cell through the use of a vesicle.

(2) Example: Proteins made by the Golgi apparatus are packed into vesicles that fuse with the cell membrane and release the contents outside the cell.